Engineering Sciences and Applications Division

Stockpile *Assessment*

Ensuring Weapons Performance

Imagine keeping a vintage automobile in tiptop shape for stock car racing without being allowed a single test drive. The nuclear weapons program keeps up the stockpile under a similar constraint. For over a decade, the Engineering Sciences and Applications Division (ESA) at Los Alamos has been conducting engineering assessments on the stockpile to detect any changes in the nation's aging weapons and to refurbish parts when required. These steps ensure that the weapons will perform to specifications in all stockpile-to-target sequence (STS) environments. Derived from military logistics, STS environments range from vibrations during handling and transportation to thermal extremes or atypical situations such as fuel fires.

To support ESA's experimental program, the division sponsors a Machinist Apprentice Program at Northern New Mexico Community College that trains journeymen machinists who will subsequently work at ESA machine shops and high-explosives processing facilities. The coursework involves more than 8,000 hours to attain craftsman proficiency in the machinist trade.

Engineers use the T558A tester to determine if a gas-bottle valve has malfunctioned before components are disassembled. This test ensures that radioactive tritium gas remains safely contained. Shown in dark blue in the background of this poster is a drawing of a traditional orthographic assembly. (Left) The top picture is of the tester model as viewed on a computer screen, and the bottom photo is of an actual tester attached to a valve during a training demonstration.

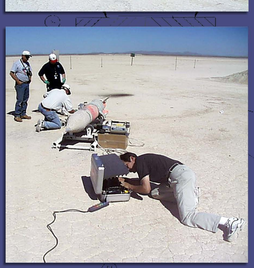
Resting on an "assembly stand" at the Pantex Plant near Amarillo, this W88 warhead has its reentry body wrapped in red protective material. ESA engineers and Pantex tooling designers improved the assembly stand's design to enhance worker safety during the warhead's disassembly and subsequent reassembly.

Acquiring and Analyzing Data

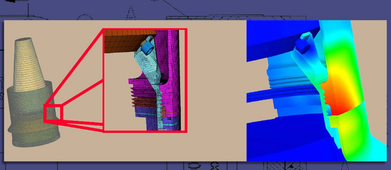
To ensure the safety and reliability of Laboratory-designed weapons, Los Alamos engineers assess weapons under STS environments by using a combination of statistical sampling, computer simulations, and realistic testing. Every year, nine to 11 randomly chosen weapons are recalled from military service and disassembled at the Pantex Plant. Pantex sends selected components to other facilities for destructive and nondestructive tests.

Los Alamos acquires and analyzes the data. If an assessment uncovers a significant concern, the Laboratory generates resolution plans and answers the engineering aspects by applying tools such as forensic analysis, simulation, and testing.

To disassemble and rebuild weapons, Los Alamos engineers develop and apply ultrasafe tooling and handling procedures. The Laboratory and Pantex assess thousands of hypothesized accident scenarios to identify and mitigate potential hazards.



Working with other National Nuclear Security Administration and military organizations, ESA helps conduct surveillance tests, in which mockups of nuclear weapons are subjected to realistic situations to demonstrate their reliability. In this surveillance test, a B-61 look-alike weapon is dropped from a B-2 bomber (top), recovered (middle), and prepared for post-test data interrogation and radiography (bottom).



ESA engineers use computational tools derived from commercial and ASCI (Advanced Simulation and Computing) sources to develop high-fidelity computer simulations. These simulations help designers explore weapon structural response to a vast number of normal and abnormal stockpile environments.

Dan Varley, ESA-DO, varley@lanl.gov,
505-667-2233

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